February, 1955

THE CHEMIST

VOLUME XXXII NUMBER 2

—Fabian Bachrach

Dr. Arthur Osol

Receives Pennsylvania AIC Chapter Honor Scroll

(See Page 49)

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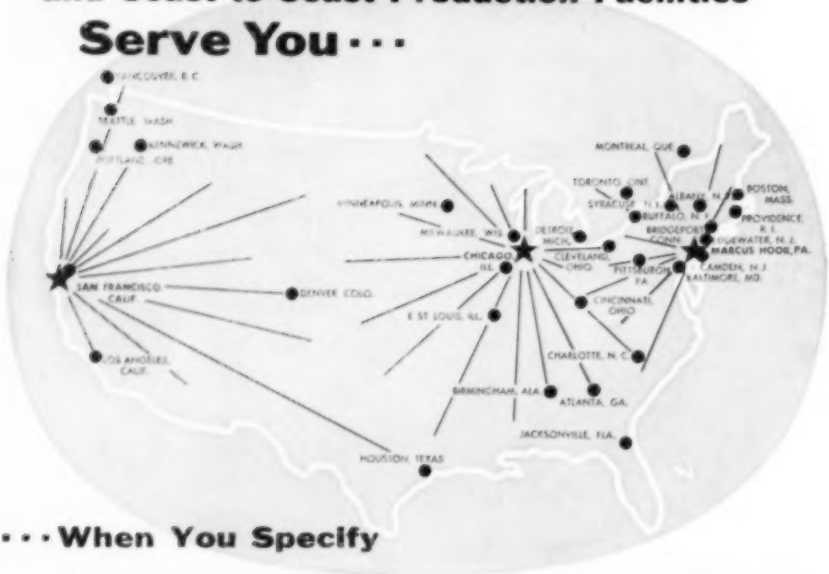

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TO COME IN MARCH

Dr. Eduard Farber, F.A.I.C., who received the Honor Scroll of the Washington Chapter, will present some new ideas in his acceptance address on "Philosophy and Industrial Chemistry — a Personal Story." • There will be a preview of the program for the 1955 Annual Meeting to be held at the La Salle Hotel, Chicago, Ill., May 11-13, with the Chicago Chapter acting as host. The theme of the meeting is "Working With People." • A suggested employment contract for chemists and chemical engineers will be given. Entitled, "Professional Employment Agreement", it is the result of many months of work by the Sub-Committee of the Committee on Employer-Employee Relations. Reprints will be available. • Those who would visit England, now that spring is here, may be interested to know what the title, "Fellow", in British societies designates. Dr. Ernest H. S. van Someren will tell us.

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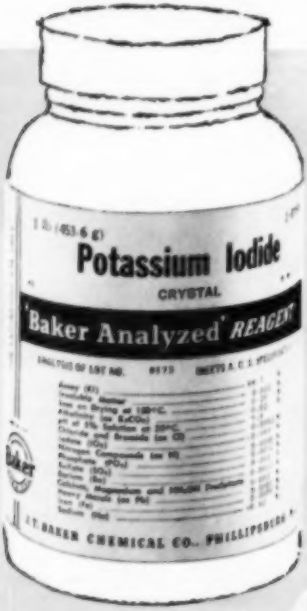

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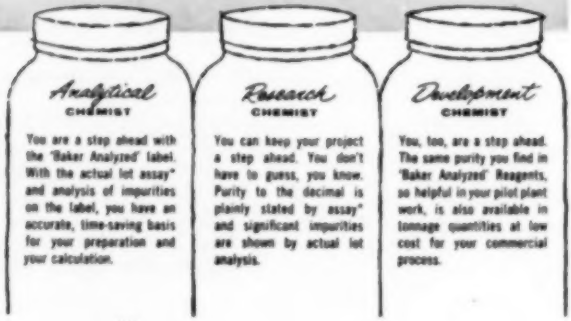

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EDITORIAL

Who Speaks for Scientists?

V. F. Kimball

> ". . . there came this tremendous burst of light, followed shortly by the deep growling roar of the explosion . . . which warned of doomsday and made us feel we puny things were blasphemous to dare tamper with the forces heretofore reserved for the Almighty. Dr. Kistiakowsky threw his arms around Dr. Oppenheimer and embraced him with shouts of glee"
>
> (*Smyth Report,* 6th Printing, 1946)

Before the above events at Alamogordo took place, scientists, from Copernicus to Lavoisier, were pictured rather as being in league with the Prince of Darkness. It is narrated that Dr. Faustus even entered into a contract.

Since Alamogordo, however, certain groups of scientists seem to imagine kinship with deity, if not parity therewith.

Thus if one of their group is brought up for violation of local conventions or national laws, they plead his cause publicly:

> "Our confidence in his loyalty and patriotic devotion remains unimpaired as our admiration for his magnificent public service is undiminished." (Statement signed by 26 members of the Institute for Advanced Study, "issued 24 hours after the AEC voted 4 to 1 to bar Dr. Oppenheimer from access to confidential data as a security risk.")

With little regard for national boundaries, individual scientists also gave vent to their opinions in the daily press. Dr. Placzek, an Austrian scientist (now an American citizen) and member of the Institute for Advanced Study, said:

> "I consider it extremely dangerous to question a man's motives in the event of a disagreement. This is bound to lead to a condition under which a democracy cannot operate. It is, after all, not only a scientist's right to argue his point — it is his duty."

It is quite clear that the patient, meticulous and self-effacing scientist of days gone-bye is a thing apart in his aims and ambitions from some of these modern products of the atomic age, the sponsors of the *Bulletin for Atomic Scientists,* for instance, who speak for themselves:

> "And it is through this Bulletin that such experts in their respective fields as J. Robert Oppenheimer, David Lilienthal, Leo Szilard, Francis Biddle, Hans Bethe, Gordon Dean, Lord Boyd-Orr and many more, have addressed themselves to a selected world-wide audience of responsible scientists, policy-makers, leaders in public opinion, who can in turn influence millions of citizens to assure the survival of democratic society and free science."

Thus there are some scientists who are not content with addressing other scientists or the public *on behalf of some scientists,* but would reach out for "policy-makers and leaders in public opinion who can in turn influence millions of citizens" on matters of primarily general interest not necessarily on behalf of scientists. This is clearly political propaganda, but to what end? Do they want a political party of their own, or do they want

to be above all parties and governments?

Time was when politicians chided the intelligentsia with indifference to politics. Now, certain groups among the intelligentsia seek to get "leaders in public opinion" to "influence millions of citizens to assure the survival of democratic society." This is rather a large contract for those whose lives are dedicated to the pursuit of knowledge.

We do not believe that the majority of level-headed scientists will care to be swayed by extreme minorities which have no mandate to speak for scientists as a whole. Nor do we believe that scientists can be herded into this or that political party or even a new party of their own devising; they will continue to behave as individuals in opinions and tastes.

Appointed: Dr. Max Tishler, F.A.I.C., as vice president for scientific activities of the Chemical Division of Merck & Co., Inc., Rahway, N. J. He succeeds Dr. Per K. Frolich, who has resigned to accept an appointment to the top civilian scientific post in the Army Chemical Corps.

Appointed: Dr. R. L. Bateman, F.A.I.C., to the newly created position of director of product development of Union Carbide and Carbon Corporation, New York 17, N. Y. He was formerly manager of the Fine Chemicals Division of the firm.

AIC Gold Medal for 1955 Awarded to Dr. Marvel

Dr. Carl S. Marvel, research professor of organic chemistry at the University of Illinois, Urbana, has been unanimously chosen to receive the 1955 Gold Medal of THE AMERICAN INSTITUTE OF CHEMISTS.

Dr. Foster D. Snell, F.A.I.C., chairman of the Medal Award Committee, announced that the award was made in recognition of Dr. Marvel's noteworthy and outstanding service to chemists through his inspired teaching for many years and because of his noteworthy research in the field of organic chemistry.

Presentation of the medal to Dr. Marvel will be made at the Thirty-second Annual Meeting of the Institute, to be held at the La-Salle Hotel, Chicago, Ill., May 11-13, 1955.

Announced: By Dr. John E. McKeen, Hon. AIC, president of Chas. Pfizer & Co. of Brooklyn, N. Y., plans for the construction of new plants for the manufacture of antibiotics in Chile and Argentina. He returned recently from a tour to Peru, Chile, Argentina, Ecuador, and Colombia. While in Chile, he was awarded the Order of Merit of Bernardo O'Higgins.

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Dr. Arthur Osol, *F.A.I.C.*

Professor of Chemistry & Director of the Department of Chemistry, Philadelphia College of Pharmacy and Science, Philadelphia, Pa.

Presented when the author received the Honor Scroll of the Pennsylvania AIC Chapter, Dec. 2, 1954, at Penn Sherwood Hotel, Philadelphia, Pa.

CHEMISTRY in the United States received its greatest impetus during World War I, when we came to realize how dependent we were on Germany for certain vital chemicals and for much of our knowledge of chemistry. The subsequent development of chemistry and of science generally in this country, along with the simultaneous development of our industry, may well be the greatest national achievement of the 20th century. But in recent years this otherwise bright picture has become clouded by the realization that we are in the midst of a serious shortage of science teachers and on the verge of a shortage of scientists.

The editorial page of *Chemical & Engineering News* recently carried the following significant statements, credited to *New York Times* educational editor, Benjamin Fine, in a feature story the week before:

> "The Free World is in danger of losing the important technological race for trained scientists, engineers, and technicians. The Soviet Union is making an intensive effort to increase its supply of technically trained personnel. The quality of Soviet technical schools and colleges is rising while in the free nations little emphasis is placed on the training of scientists, engineers, or technicians. The shortage of qualified science teachers in secondary schools is critical."

Such statements are not intended to be merely alarmist. They are based on facts gathered by many agencies, including the U.S. Office of Education, and President Eisenhower's cabinet committee on scientific manpower. From these and other sources we receive information to the effect that (1) about 50 per cent of all high schools do not offer chemistry and a similar proportion do not offer physics, (2) schools are experiencing difficulties in obtaining proper physical facilities for teaching and are finding it difficult to obtain qualified teachers, (3) our country is not preparing enough men and women in the natural sciences, the health fields, teaching and engineering. The fact that Great Britain is in a similar predicament serves only to accentuate the acuteness of this problem for the Free World.

What is responsible for this serious situation? The answer given all too often, indeed almost without excep-

tion, is lack of adequate financial reward for scientists, and especially for science teachers. The director of one of our important federal laboratories attributes Government's inability to attract more qualified scientists to the fact that industry pays higher salaries. A British committee appointed to study the problem of the shortage of science teachers reported:

> "It would be unrealistic, and indeed misleading, not to give prominence to the question of financial rewards. Until this question is dealt with satisfactorily by the authorities concerned other remedies are not likely to be effective."

While agreeing that scientists, and especially teachers, generally receive inadequate financial remuneration for their services, I doubt very much that lack of financial reward is the basic reason for the shortage of teachers and scientists. It is unfortunate that there is a tendency in some quarters to hastily jump to this conclusion, and it is deplorable that there appears to be some trend toward evaluating all forms of human endeavor in terms of financial reward only. Such a basis of evaluation is not ,and never can be, a common denominator for relating the merits of different professions, or of different areas of specialization within a profession, or of people themselves. I find it impossible to believe that the question of financial reward now motivates people so completely that little else matters when a job is to be selected. If financial reward were the important criterion, we should have had a critical shortage of science teachers and perhaps even of scientists decades ago. For example, in 1928, when I started out as a chemistry teacher, I had the choice of accepting an $800 a year position as a teaching assistant or an industrial position in chemistry which paid almost three times as much salary. A requirement of the former position was that I had to continue with graduate study, for which an allowance of $100 a year was made. Probably thousands of science teachers had the same choice to make as I did, and, like myself, are glad they decided in favor of teaching.

Why would a person, thousands of them in fact, accept a job paying considerably less than another job which is simultaneously available? Certainly few if any teachers are endowed with financial resources so that they need have no concern about the difference in income. The obvious answer is that notwithstanding the smaller financial reward there must be other values that more than compensate for the added financial return of the higher-paying job. It is indeed true that man does not live by bread alone. It may interest you to know about some of these values that lead me to the conclusion that teaching is chemistry's most rewarding opportunity.

To be sure, the majority of chemistry teachers in colleges and univer-

sities find it necessary to supplement their incomes, commonly by providing other chemical services. Often such service takes the form of participation in a supported research program in the teaching institution, but frequently it represents some service to industry rendered outside the teaching institution. Some teachers find writing to be an interesting and profitable supplementary activity. Most college administrators consider a reasonable degree of extra-curricular activity of this kind to be not only helpful to the teacher but mutually beneficial to the university or college and to industry. The additional income so derived goes a long way toward providing not only for the necessities of life but for some of its abundances as well. Occasionally a teacher gifted with talents of exceptional practical utility may even find his total financial reward to be quite substantial; not all teachers are as poor as the traditional church mouse! However, the prospect of great financial success can not, and in any event should not, be held out as an inducement to a young man contemplating a career in teaching.

What, then, are the other rewards that make of teaching a desirable career? Is one of them what so many people consider to be the three months vacation which most teachers appear to have each year? Definitely not, since the large majority of teachers, being paid for but nine or ten months of teaching service must work during this time. My own experience has been that in only four of the twenty-six so-called summer vacation periods of my teaching career have I been able to enjoy more than two weeks of vacation, and many years there has been no vacation at all. For the young teacher especially the arrival of summer vacation may be a time to be dreaded, for this is often the period of uncertainty of income, with the prospect of obtaining work for the period sometimes being quite remote. If fortune smiles, a teacher may in later years be able to more fully utilize the summer for vacation purposes, but this is a matter of considerable uncertainty.

Ask the average teacher, or scientist, why he selected his career and the answer will be that he has a great liking for his work and considers himself to have some aptitude for it. I doubt that any one would cite the prospect of high financial reward as an incentive for selecting a particular profession. Teachers and scientists are reward-minded, but they are equally mindful of rewards that are not monetary as well as those that are. I am of the opinion that the reason there are not more scientists, and especially teachers, is that so few young people at the time of choosing their careers are adequately informed of the opportunities in science and in teaching. Too much emphasis is placed by vocation counselors on monetary returns, and too little on the

other important rewards of any specific career. We often hear how much a high school or college education is worth in dollars, but all too infrequently are we told about its other values. It is time that all of us who are responsible for youth guidance give serious thought to acquiring a more balanced sense of life values.

Let us return now to the discussion of the non-monetary values to be found in teaching. One of life's richest rewards is the knowledge that in dealing with people you have given them value beyond any payment you received from them. Some may say this isn't very good business, but finally each of us will have to admit that it is truly more blessed to give than to receive! Perhaps the greatest reward for anyone is in having an opportunity of participating in the building of the lives of men and women, of helping to prepare them for a life of usefulness and service. Every teacher worth the name invariably gives more to his students than they pay in tuition; it could not be otherwise! And only a teacher can appreciate how great is his reward when the student he has helped to teach matures into a respected and useful citizen; it is one of life's real pleasures. And I can assure you that this seemingly intangible reward has a very tangible reality in the mental and physical uplift the teacher receives.

Perhaps the second most important non-monetary reward of a teacher is the opportunity of being a student all his life. It is obvious that one cannot be a successful teacher if he is not first and always a student. I am grateful that I am always under more or less compulsion to develop and extend my general and scientific knowledge. A teacher can never rest on the laurels of past performance; science changes too rapidly to allow this to happen. Typical of perhaps hundreds of new experiences I have had while teaching have been those of first learning, then teaching, such new technics of chemistry as those of microanalysis, instrumental methods of analysis and most recently, of the use of radioisotopes. I know of no other area of science where this opportunity, and reward, is as great as in teaching. It is a tragic fact, however, that sometimes teachers, particularly in secondary schools, receive little encouragement to disturb the *status in quo* of a curriculum, in consequence of which they fail to realize this reward and their institution fails to progress. Such a situation may ultimately discourage a teacher more than any shortcoming of financial reward. I am thankful that although the college with which I am connected must always be mindful of its resources, its administration has given every encouragement and provided adequate material means for maintaining a forward-looking education program.

A third reward, obviously not a

financial one, is that of rendering service, fee-free, to the public at large and to other non-profit agencies. To give some illustrations out of my own experience, it was my privilege some years ago to be a collaborative research worker for the League of Nation's Health Committee in a study of methods of analysis of opium and coca in connection with international control of these narcotic drugs. While a considerable portion of my time during four years was devoted to this activity, with no financal return whatsoever, I count that experience as one of the most useful I have had. Another such experience was that of serving as a member of the Technical Advisory Committee of the Smaller War Plants Corporation, a federal agency, during World War II. Since 1950 it has been my good fortune to be a member of the Committee of Revision of the *United States Pharmacopeia.* While many hours have been devoted to this work, I should feel a serious void in my total experience if I had not had this opportunity of being of service to the USP and to my fellow citizens. All of these experiences constitute a lasting value which no financial reward could replace.

A fourth reward is again an opportunity of performing a service, namely, that of conducting or participating in unrestricted research. While we in the United States are very much research-minded most of our research is directed along certain lines. In colleges and universities, however, one can usually decide for himself what research he would prefer to do, and indeed, such choice is encouraged. Every one who has had the opportunity of choosing, planning, and performing his own research program knows only too well that he has been well-rewarded in having the opportunity, even in the absence of monetary return.

Lest any one receive the impression that the abundance of these non-monetary rewards is so great that the recipient is likely to finish his days in the poorhouse, I would emphasize that it would be surprising indeed if in the course of one's doing his dead-level best along these lines there will not have come opportunities for adequate financial reward as well. It has been my observation that teachers who have toiled assiduously through many years have not been without recognition by those who can utilize the teacher's services and pay them dollars, and I suspect that with increasing years of service the disparity of the financial reward of the teacher diminishes. It may well be that in consequence of this there will not be many free hours for the teacher in his weekly schedule but, as we observe a general inability of people with many free hours at their disposal to spend them wisely, being busy may be a reward in itself.

In summary, it would appear that

the shortage of science teachers and scientists is not primarily attributable to a lack of financial reward, even through this may be an important consideration. The people that our nation needs as its teachers and scientists are not those who will make their decision of a life's career solely on the basis of financial reward. The shortage that exists is more likely the result of our failure to acquaint young people who are choosing their life careers with the many worthwhile rewards, besides the financial one, that are provided in science and in its teaching. In our secondary schools especially young people should be encouraged and given an adequate opportunity to study science, and be fully informed of its career opportunities. Likewise, their teachers should be afforded means of continuing their own studies and of developing science studies in the school curriculum. Finally, we in science should avoid an apologetic and negative attitude toward our profession because of any real or fancied lack of financial reward, since in the end we belittle ourselves as well as our profession by such an attitude.

Dr. Arthur Osol

Dr. Ivor Griffith, *F.A.I.C.*

President and Dean, Philadelphia College of Pharmacy & Science, Philadelphia 4, Pa.

(Presented when Dr. Osol received the Honor Scroll of the Pennsylvania AIC Chapter.)

I SALUTE you on the good judgment exercised by those responsible for choosing for this high honor a man who has in every sense of the word brought entitlement to such recognition. I am happy to announce with pride that I had the privilege of being one of Dr. Osol's teachers. And ever since my first recollection of him I had marked him as a man of high destiny for high service, and he has never let that impression down.

Since I am to give something of a monograph on this crystal character, I now give you some of the highlights of his life and of his services. Since he is still a young man, there is every likelihood that plotting his growth and service to his fellow men to date will inevitably mark it as one of ascending value, and accordingly my monograph should end with "to be continued."

Arthur Osol was born in Riga, Latvia, December 1, 1905. In 1906 his parents came to Philadelphia and he has resided in this city or its environs ever since. (Benjamin Franklin, citizen of the world, many long years ago, showed equally good judg-

ment, by leaving Boston as a youth and journeying to Philadelphia where he found ample latitude for his brilliance.) Dr. Osol graduated from the Northeast High School, a traditionally good, sensible Philadelphia High School, and then he attended the Philadelphia College of Pharmacy and Science, another traditionally fine and free-spirited institution, receiving the degrees of Ph.G (in 1925), B.Sc. in chemistry (1928), and M.Sc. in chemistry (1930). From the Universty of Pennsylvania he received the degrees of M.Sc. (1931) and Ph.D. (1933). He has also completed specialized studies at New York University, University of Pennsylvania, and Oak Ridge Institute of Nuclear Studies.

He started his professional career as assistant in chemistry at the Philadelphia College of Pharmacy and Science in 1928, with successive promotions to his present positions of professor of chemistry and director of the Chemistry School and Department. Courses of instruction in quantitative microanalysis, instrumental methods of analysis, and radioisotope technics are among the contributions he has made to the advancement of chemistry instruction at the College.

Besides his teaching assignments, Dr. Osol has found time to engage in many professional and civic assignments. He is well-known as a consultant in pharmaceutical chemistry. Approximately thirty-five publications on chemical researches and nearly two-hundred other scientific articles bear his name; most of the papers in the latter category deal with laboratory studies of methods of formulating and compounding medicinals undertaken while he served for thirteen years as technical editor of *American Druggist*. From 1933 to 1937 he was a collaborating research worker for the League of Nation's Health Committee investigating methods of analysis of opium and coca. In 1950 he was elected a member of the committee of revision of the *United States Pharmacopeia,* in connection with which he developed specifications for thirty new medicinals and dosage forms for the forthcoming edition of that compendium; the analytical procedures of these medicinals utilize principally spectrophotometric and nonaqueous titration methods, the latter introduced in the *Pharmacopeia* for the first time.

Since 1945, Dr. Osol has been editor-in-chief of the *United States Dispensatory,* a 2000-page, internationally-famous commentary on medicinals. He is also chemical editor of Blakiston's *Medical Dictionary,* and associate editor of *Remington's Practice of Pharmacy*. All three books will appear in new editions in 1955.

During World War II he studied many problems of production of medicinals for the armed services, being a member of the Science Advisory Committee of the Federal Smaller

War Plants Corporation. More recently he was chief of the Chemical Branch of the Philadelphia Civil Defense Council, organizing a training program for nearly eighty chemists in this area.

Dr. Osol is a member or fellow of many scientific organizations, including honorary societies, and is also an active member of the Philadelphia Club of Rotary International. In 1943-44 he was chairman of the Philadelphia Section of the American Chemical Society, and for many years served also as a councilor and director. He has also been chairman of the Philadelphia Section of the Electrochemical Society, president of the Philadelphia Branch of the American Pharmacuetical Association, and vice president of the Philadelphia Science Council. Biographical listings of him are included in *Who's Who in America, Who's Who in Commerce and Industry, American Men of Science, Chemical Who's Who,* and other reference works.

In 1928 Dr. Osol married his college classmate Virginia Lebo, of Philadelphia; they have no children. Dr. and Mrs. Osol travel extensively, having been in Europe three times since 1950. They reside at 128 Colwyn Lane, Cynwyd, Pennsylvania.

So do I end the formal monograph which in pharmacopeial language has given many of the doctor's physical constants, his spiritual and other services.

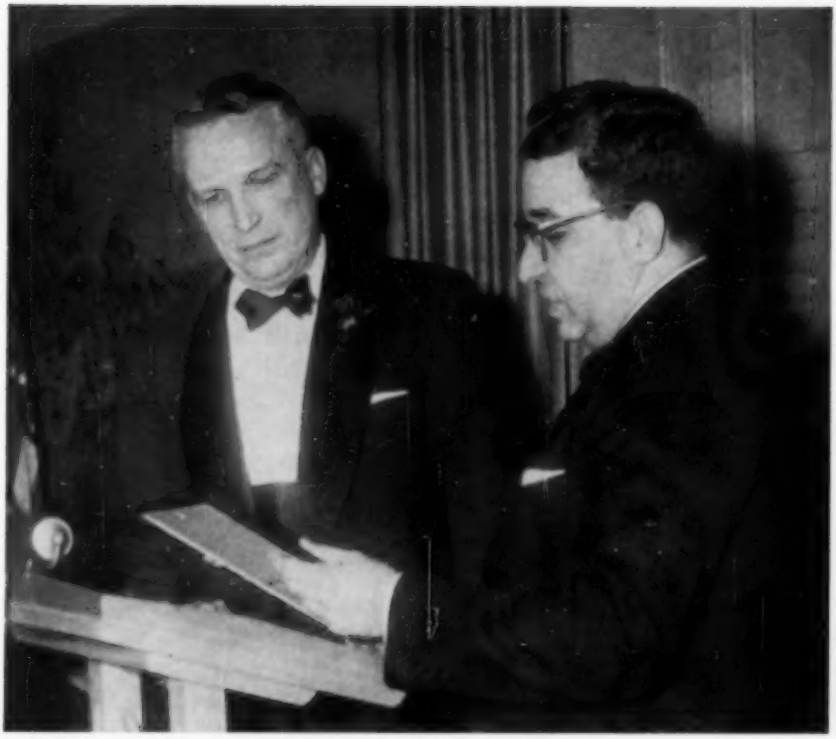
On behalf of our College, I avow that we share with pride this honor conferred upon our brilliant associate. To me, Dr. Arthur has demonstrated the validity of what I have on several occasions given as the three capital I's—the priceless ingredients of success in service and happiness:

*I*ntelligence
*I*ndustry
*I*ntegrity

One could never question the fact that Dr. Osol's constant growth and progress has issued from his ownership of these three attributes. As one who has known him quite intimately for many years, I have relished in him the reliability and the dignity of his character, and I return, therefore, to this honest, earnest sentiment that we wish him well, and we also are glad to give our compliments to his wife, Virginia, who has forever been a cheerful, helpful partner.

To our guest of honor, on behalf of the Board of Trustees of our College, the entire faculty, and our seven-thousand-odd alumni, and speaking also for the membership of the AIC and his many friends in Philadelphia, we join in approval of the choice of that group which selected from many, Dr. Arthur Osol, as the Pennsylvania AIC Chapter's Man of the Year and recipient of its 1954 Scroll of Honor.

New Office: Opened in Chicago at 662 N. Dearborn St., by Ansul Chemical Co. of Marinette, Wis.



Dr. Arthur Osol and Dr. Robert Kunin, Chairman of the Pennsylvania Chapter

Presentation to Dr. Osol

THE HONOR SCROLL of the Pennsylvania Chapter was presented, December 2, 1954, to Dr. Arthur Osol, director of the Chemistry Department of the Philadelphia College of Pharmacy and Science, at a dinner of the Chapter held at the Penn Sherwood Hotel, Philadelphia, Pa.

Dr. Robert Kunin of Rohm & Haas Company, chairman of the Chapter, presided. Dr. Ivor Griffith, president and dean of the Philadelphia College of Pharmacy and Science spoke on Dr. Osol's career. Dr. Donald B. Keyes, president of the Institute, presented the scroll to Dr. Osol, who responded with an address entitled, "Teaching — Chemistry's Most Rewarding Opportunity." (See preceding pages.)

The citation to Dr. Osol reads:

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Consultant: Dr. Donald Price, F.A.I.C., and national AIC councilor, who has left Oakite Products, Inc., where he was technical director since 1945, to go into the consulting business, in the fields of surface-active agents, cleaning materials, the chemistry of oils and fats, and research administration.

He holds thirty-five U. S. and foreign patents, and is author of many original research and technical papers in the fields of organic chemistry, vitamins, oils and fats, and surface-active agents, and of the book, *Detergents, What They are and What They Do.* After receiving the Ph.D. degree at Columbia University in 1930, Dr. Price spent two years in research in Europe at the Universities of Cambridge and Munich and taught at Columbia for five years. He has also been associated with National Oil Products Co. (now Nopco Chemical Co.) and with Interchemical Corp. His address is 123 E. 92nd St., New York 28, N. Y.

Created: By Standard Oil Development Company, New York 19, N. Y., a Scientific Liaison Office, to be managed by Dr. Cecil L. Brown, F.A.I.C. The new unit will coordinate the company's activities with educational institutions, scientific societies, and scientific consultants. Dr. Brown was also appointed chairman of the Contributions and Research Grants Committee.

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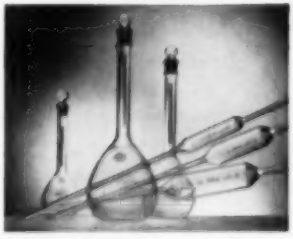

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New Company: Biotronic Laboratories of Coventry, Conn., has been formed by John B. Rust, F.A.I.C. formerly research director of Montclair Research Corporation and of Shulton, Inc. The new company manufactures fine chemicals, biochemical reagents and physical accessories, and also engages in consulting work in the field of high polymers, textile chemicals, agricultural chemicals and radioactive tracer research.

Renamed: Kern, Indiana, to Olin, in honor of the new cellophane plant to be constructed there by the Olin Mathieson Chemical Corporation.

Honored: Dr. Harry L. Fisher, F.A.I.C., with the Chandler Medal of Columbia University, November tenth, for "his outstanding contributions to the chemistry of synthetic rubber." Dr. Fisher, visiting professor of chemical engineering at the University of Southern California, and national AIC councilor, predicted that tires of the future will run 100,000 miles, be virtually puncture-proof, and will be made in colors to match the car. These tires are even now in the early development stage.

Elected: Dr. Clifford F. Rassweiler, F.A.I.C., as director-at-large of the American Chemical Society for a four-year term. He is vice-president for research and development of the Johns-Manville Corporation, New York, N. Y.

In Baghdad: Dr. Lawrence W. Bass, F.A.I.C., vice president of Arthur D. Little, Inc., Cambridge, Mass., who is working with the U.S. Foreign Operations Administration and the Iraq Government to develop a detailed program for an industrial survey of that country.

New Position: For Robert W. Kell, F.A.I.C., who is now working for the patent law firm of Stevens, Davis, Miller & Mosher, Munsey Bldg., Washington 4, D.C. He was formerly with the patent department of American Cyanamid Company.

Fluorochemicals

R. M. Adams

Fluorochemicals Department, Minnesota Mining & Manufacturing Company, 900 Fauquier Ave., St. Paul 6, Minnesota

(Condensation of a paper presented at the 31st AIC Annual Meeting. Revised to bring it up-to-date as of February 1955.)

THE industrial history of fluorochemicals started, about 1930, when a new class of refrigerants were introduced, as the result of carefully executed research by Midgely and Henne. These new products, the Freon refrigerants, were compounds of carbon, chlorine, and fluorine. They had thermodynamically desirable properties, were stable, odorless, non-corrosive, and non-toxic.

Industrial fluorochemicals are in their infancy. The future of this promising field is in the hands of the chemist and the engineer.

The next commercial carbon-fluorine compounds resulted from accident, curiosity, and chemical development. Known in 1933, no practical applications for the gas, tetrafluoroethylene, could be found. About 1938, a Du Pont researcher found an apparently full cylinder of the gas without pressure. He cut open the cylinder and discovered that the tetrafluoroethylene had formed a white, powdery polymer. A number of years of research and development then resulted in a marketable product. Small amounts of the polymer were available to the U. S. Government during World War II. Since then few major industries do not know of or use Teflon. Its resistance to solvents and chemicals, even at elevated temperatures, have made it desirable in the chemical process industries. Its electrical properties and low adhesion surface are making it valuable in other applications.

The polymers of monochlorotrifluoroethylene, or perfluorovinyl chloride, though known in 1937, were revealed to industry in 1947, through developments sponsored by the Manhattan project. Some of the trade names of these polymers are *Kel-F, Fluorothene, Fluorolube,* and *Halocarbon.* As liquids and greases, they are used as lubricants, seals, and plasticizers where long life, nonflamability, non-corrosiveness, heat resistance, and chemical resistance are important. As plastics they are useful as electrical insulating films and moldings, protective coatings, gaskets, and special parts. They can be easily molded and fabricated.

Chlorofluorocarbon gases serve as raw materials for these polymers, as refrigerants, and also in the propellant or aerosol market.

In spite of these spectacular practical applications of a few carbon-fluorine compounds, progress in developing a broad group of inert and reactive fluorochemicals has been slow because of the lack of a simple, economical means of production. The Swarts reaction, treatment of a polychloro compound with antimony fluoride and anhydrous HF, is satisfactory for the fluorination of simple molecules as in the synthesis of Freon gases, but unsuited for longer chain molecules. Direct fluorination, addition of hydrogen fluoride to olefins, and fluorination with cobalt fluoride are similarly unsuited processes.

Electrofluorination, the newest method. is the most practical for preparing a wide range of fluorochemicals, particularly compounds having four to twenty carbon atoms per molecule. In the electrochemical process, discovered by Simons and commercially developed by the Minnesota Mining & Manufacturing Company, an organic compound is dissolved in liquid hydrogen fluoride and a low voltage direct current is passed through the solution. Elementary fluorine is not produced and thus a stable operation is achieved. The process is continuous and a single cell with process equipment can be used to produce a wide range of inert and reactive fluorochemicals, among which are perfluoroalkanes, perfluorocarboxylic acids, perfluorotertiary amines, and perfluoro ethers.

The leading premium property of fluorochemicals is stability. Molecules in which the carbon atoms possess more than one fluorine atom are, in general, more stable than the corresponding hydrocarbon, due to the tremendous energy which binds fluorine to carbon. Fluorocarbon plastics, for example, are resistant to all tpyes of solvents and chemicals. The inert liquids are chemically, thermally, and electrically stable. Completely fluorinated compounds are non-flammable and generally non-toxic, and have high density, low boiling points for high molecular weights, low surface tensions, high liquid compressibility, low refractive indices, and immiscibility with hydrocarbons and water.

A consideration of the areas in which fluorochemicals are being applied will emphasize the usefulness of their general properties and show where the new products of the electrofluorination process may be found useful.

Freon gases did not find a market as refrigerants because of their thermodynamic properties alone. Other refrigerants were also efficient and cheaper, but they had the disadvantages of being corrosive under certain conditions, of having disagreeable odors, and, in some instances, of being somewhat toxic; disadvantages not present witih the chlorofluorocarbon gases. The stability of the carbon-fluorine bond that makes Freon gases non-corrosive, non-toxic, and odorless, resulted in a premium prod-

uct that found a tremendous market.

The widest application of fluorocarbons in industry is in the field of the plastics as represented by such trade-named materials as Teflon, Kel-F, and Fluorothene. Here too, their usefulness is attributed to the properties that are the result of the fluorine atoms in the molecular structure of the plastic. Despite high cost, consumers feel that they get their money's worth in the new order of stability offered. The chemical process industries have been among the first to make use of fluorocarbon resins. The electrical industry has been almost as quick to appreciate the unusual stability of these plastics, their resistance to high temperatures, weathering, and good electrical insulating performance.

Lest the impression be given that the present fluorocarbon plastics are a panacea for all problems of chemical resistance, heat stability, and electrical insulation, let it be said that there are shortcomings. The inertness of these materials makes them difficult to apply under many conditions. There are few solvents for them so special methods must be used for applying them as coatings. The fusion of films of Teflon and Kel-F is necessary to obtain a continuous surface, and they must be heated to rather high temperatures before they will fuse. This limits them to applications where the covered surface is resistant to the heat of fusion. Their anti-hesive nature makes adherence to surfaces an additional problem.

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Many of these difficulties are being overcome by chemists and engineers. However, there is room for new materials with similar heat and chemical resistance but with better handling characteristiics and mechanical properties. Such new materials may well come from the products of electrofluorination. Among plastics derived from the perfluorocarboxylic acids, which are products of electrofluorination, (already mentioned in the chemical literature) are vinyl esters, made from such acids as trifluoracetic and perfluorobutyric. Fluorinated poly acrylates and co-polymers of perfluoro olefins with standard monomers are also reported. Variations possible with available reactive fluorochemicals are numerous and we may expect new fluorinated plastic products.

Fluorinated liquids and gases are following the plastics into the electrical field. Some of the fluorocarbon gases have high dielectric strengths being three to four times as resistant to breakdown potentials as nitrogen.

In fact, some of them at moderate pressures approach the breakdown potentials of ordinary transformer liquids and could replace some at lower cost. The liquids, such as triperfluorobutylamine and perfluorocyclic ethers, are interesting examples of the electronegative effect of fluorine in a molecule. Hydrocarbon amines and ethers are basic in character, readily forming salts with strong acids. The replacement of hydrogen by fluorine in such compounds removes all evidence of basicity, the molecules becoming chemically inert, enhancing their electrical and thermal stabilities.

The inert liquids have large coefficients of expansion, high densities, and low viscosities, and thus are subject to a high degree of turbulence. They have low surface tensions and are extremely effective in penetrating and wetting. This combination of qualities leads to high efficient heat dissipation in convective systems, and would logically point to their use as coolants in electrical equipment and as dielectric fluids.

The inert character of fluorinated liquids is advantageous in special instruments and engineering devices. Here stability is combined with density, low refractive index, compressibility and low viscosity to provide the sought-after result. In instrumentation, either mechanical or electrical, fluorochemical liquids do not attack the usual materials of construction. Plastics, rubbers, paper, and metals, are not attacked by such liquids as triperfluorobutylamine and perfluoro cyclic ethers.

Fluorochemicals have exceptionally low surface tensions. Some of the longer chain acids, as perfluorooctanoic acid, are capable of reducing the surface tension of water from 72 dynes/cm to 16 dynes/cm. Commercially available surfactants reduce surface tension only to 28 dynes/cm. Further, the inherent stability of fluorochemicals makes it possible to lower the surface tension of such potent chemicals as fuming nitric acid and 90 per cent hydrogen peroxide. There are many highly reactive systems where wetting action or penetration is desirable, but cannot now be achieved with present commercial compounds. There are many applications, such as in paints, cleansing compositions, and lubricants, where it would seem advantageous to mix a fluorochemical derivative with conventional hydrocarbon base products. The source of such a derivative may well be one of the perfluoro acids produced by the electrofluorination process.

Perfluorocarboxylic acids are a new class of strong acids whose resistance to oxidation and reduction is exceptional. They serve as the starting point for the production of such derivatives as aldehydes, amines, amides, esters, alcohols. The electrofluorination process has opened up a large new horizon in chemistry.

Only a meager amount of exploratory work has been done in synthesizing new compounds by using reactive fluorochemicals. Research is proceeding in a number of laboratories and the interest is reflected in the chemical literature.

What is the cost picture? The present and future price structure is encouraging. The fact that fluorochemicals will meet requirements not met by any other class of chemicals is a factor of this price structure. Freon refrigerants and fluorocarbon plastics have shown that premium products can tolerate a premium price.

Consideration of raw material costs, process yield of products, capital investment, and manufacturing costs, indicates that the Swarts process will continue to be the major process for the production of one- and two-carbon fluorochemicals. The electrofluorination process will most economically produce higher molecular weight compounds, though research and development costs are reflected in the present high introductory prices. The price of new fluorochemicals will undoubtedly follow the established pattern as production increases. We may expect an eventual price for some of the new fluorochemicals of about a dollar per pound.

Fluorochemicals are here to stay. The major present source of fluorine is fluorospar, known deposits of which are limited and are heavily taxed by the demand for fluorine products in the petroleum, steel, aluminum, and chemical industries. However, fluorine is about three times as abundant as carbon when all sources are considered. To assure future supplies, methods may have to be developed for utilizing new natural sources.

As to the future availability of fluorochemicals from current producers, new plants and expanded facilities are in the announced plans of almost all of the major manufacturers. Collectively, industrial fluorochemicals are in their infancy. The future of this promising field is in the hands of the chemist and the engineer.

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L. T. Work, *Past President*

December Meeting

The 282nd meeting of the Council was held December 15, 1954, at The Chemists' Club, New York, N.Y. President Donald B. Keyes presided. The following officers and councilors were present: J. R. Bowman, R.P. Dinsmore, A. W. Fisher, Jr., L. H. Flett, K. M. Herstein, F. A. Hessel, D. B. Keyes, J. H. Nair, E. Ott, D. Price, P. E. Reichardt, M. Sittenfield, W. J. Sparks, and F. E. Wall. L. T. Eby, chairman of the Membership Committee: G. L. Royer, chairman of the Committee on Employer-Employee Relations, and V. F. Kimball were present.

The Secretary's report gave the total membership of the Institute as 2723. The following deaths were announced with deep regret: Harry F. Lichtenberg, F.A.I.C., on April 25, 1954, and Dr. R. H. Patch, F.A.I.C., on Nov. 13, 1954. The Council observed a moment of silence in honor of their memory.

A letter from Dr. M. S. Nichols, F.A.I.C., was presented, in which he reported as delegate to the inauguration of Dr. Miller Upton as president of Beloit College, Beloit, Wis. The Council accepted this letter with thanks to Dr. Nichols.

Miss Wall, chairman of the committee appointed at the recent Annual Meeting to prepare a history of the Institute, announced that she was placing a notice in the December issue of THE CHEMIST, requesting those who have early records to send them to the committee; and that she had written to the Chapters to seek their cooperation. Dr. Dinsmore suggested that the history of the Institute point out the accomplishments of the purposes of the Institute.

A list of those qualified for Emeritus status was presented, and upon motion,

these persons were elected to Emeritus Membership: William D. Bost, Dr. Dorah L. Burnell, Dr. Albert R. Merz, Burton L. Pfeiffer, Wilmer C. Powick, Dr. William L. Prager, Dr. Albert Salathe, and Dr. Alvin Strickler.

Mr. Nair reported on the letter from the chairman of the Western Chapter concerning the registration of chemists. Mr. Sittenfield discussed the present situation of possible ordinances in the city of Philadelphia to control the manufacture of chemicals. The Council appointed the following committee to correspond with the Western Chapter: Mr. Nair, Mr. Flett, Dr. Van Doren and Mr. Herstein.

The Committee on Constitutional Revision submitted the following changes to the Constitution, and upon motion, these were approved for submission to the membership:

Rewrite Sections 2 and 3 of Article III to read:

Sec. 2. The Officers shall be a President and a President-elect elected annually for a one-year term, and a Treasurer and a Secretary elected biannually for terms of two years. No person shall serve as President for more than two full terms.

Sec. 3. The President shall take office at the Annual Meeting immediately following or at which his election took place and shall hold office for one year. The President elect shall succeed as President whenever a vacancy in the presidency occurs, and shall succeed to the presidency upon termination of the one-year term of the President. The Treasurer and Secretary shall take their respective offices at the Annual Meeting immediately following or at which their election took place and shall hold office for two years or until their successors qualify.

Amend Article IV as follows: Add a new section 3 reading:

Sec. 3. The Board of Directors at their first meeting each year shall elect a chairman who shall preside at all meetings of the Board.

Change Article 7, Section 4, to delete the clause "and the Chairman of each such Committee shall be at the time of appointment a member of the Council."

Dr. Northey to Receive Honor Scroll

Dr. Elmore H. Northey, F.A.I.C., technical director, Fine Chemicals Division, American Cyanamid Co., New York 20, N.Y., has been chosen to receive the Honor Scroll of the New Jersey AIC Chapter, in recognition of his outstanding professional contributions as administrator, AIC councilor, author of professional articles, and inspired committee chairman.

The presentation of the scroll will be made at a dinner meeting of the Chapter to be held May 5, 1955, at the Military Park Hotel, Newark, N.J.

Dr. Dinsmore discussed preparations for the Annual Meeting program.

Dr. Keyes reported that he had attended the Pennsylvania Chapter's Honor Scroll meeting, and the presentation of the Honor Scroll of the Washington Chapter.

Dr. Fisher invited the Council to accept an invitation from the New England Chapter to hold the 1956 Annual Meeting in Boston. The Council accepted this invitation.

Mr. Reichardt discussed Scientific Classifications under Federal Civil Service, and the manner was referred to the Committee on Employer-Employee Relations for its consideration.

Mr. Sittenfield reported that the Pennsylvania Chapter awarded its Honor Scroll to Dr. Osol. In Philadelphia, there is some movement to establish ordinances that may affect chemists. The Pennsylvania Chapter will be called to appear at any hearings.

Mr. Herstein reported that hearings by the New York Civil Service Commission had been held and that he and other members of the Institute had attended.

Dr. Ott suggested that the AIC appoint a committee to meet with other societies interested in professional activities.

Dr. Eby reported for the Committee on Membership and submitted a suggested form of brochure to be printed.

An Open Memo

To: The Chairmen of Our Committees and Chapters

Yes, we know you are busy people and hold important jobs. Did you think you were elected because you were a "Dud"?

But, please remember that the membership of the AIC expects a report from you at our Annual Meeting in Chicago on May 12th.

Yes, we know that business may prevent you from being there — one of the reasons you were chosen as chairman was you belonged to the "Working Class."

But, we expect a short concise *written* report in our National Headquarters by April 12, 1955 — not a *progress* report and no alibis.

Yes, we hope you all will be able to report in person on May 12th in Chicago. Please remember we have only one business meeting a year and our membership wants a *real* business meeting, not a propaganda seminar or a somnambulent discourse on trivial details.

You each will be allowed only five minutes. This morning, (Feb. 8th) Moscow's "Business Meeting" took only four minutes and made history. We can't beat that record but we can try!

Best wishes,
D. B. KEYES
AIC President

Dr. Royer reported for the Committee on Employer-Employee Relations, and submitted a proposed contract for chemists for Council approval at its next meeting.

The following new members were elected:

FELLOWS

Bell, Russell
Executive Assistant, Victor Chemical Works, 155 N. Wacker Drive, Chicago 6, Ill.

Cunningham, George M.
District Sales Manager, West Coast, Industrial Chemicals Division, Olin Mathieson Chemical Corp., 2535 Eastland Ave., Los Angeles 22, Calif.

Nickels, Dr. Joseph E.
Research Chemist, Richfield Oil Corp., 555 S. Flower St., Los Angeles 17, Calif.

Shipp, Dr. Vladimir L.
Assistant to Director, Technical Service Dep't, Socony-Vacuum Oil Co., 412 Greenpoint Ave., Brooklyn 2, N.Y.

Young, Irving G.
Senior Research Chemist, Research Division, International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.

MEMBERS

Connelly, Robert F.
Research Chemist, Bray Oil Co., 3344 Medford St., Los Angeles 63, Calif.

McGowan, Malcolm
Research Chemist, Allied Chemical & Dye Corp., Barrett Div., Margaret & Bermuda Sts., Philadelphia 37, Pa.

REINSTATED AS FELLOW

Gross, Dr. C. E.
Director of Research, John Morrell & Co., Ottumwa, Iowa.

AIC Activities

C. P. Neidig, F.A.I.C.

Ohio Chapter

Chairman, Dr. David M. Gans
Chairman-elect, Malvern J. Hiler
Secretary-Treasurer, Harold M. Olson
Harshaw Chemical Co.
1945 E. 97th St.,
Cleveland, Ohio
National Council Representative,
Guy A. Kirton

Joins Louisville Societies' Council

At the November 23, 1954, meeting of the Louisville Engineering and Scientific Societies' Council, the American Institute of Chemists was elected to membership. The petition for membership was made in the name of the Kentucky-Tennessee Section of the Ohio AIC Chapter which has about twenty members in the Louisville Area.

This news and some information about The AIC appears in the December, 1954, issue of *The Louisville Engineer and Scientist,* publication of the Louisville Engineering and Scientific Societies' Council, now composed of twenty-two member associations.

The Council is considering such projects as the revision of existing safety and construction codes for Kentucky; the organization of a speakers' bureau to serve the local high schools; the provision of counselling service to undergraduates at both high school and college levels; and guidance for the quality of instruction being offered in the engineering colleges.

In its editorial, the *Louisville Engineer and Scientist* comments:

"It all started back a year or two ago when the local AIC members requested that they be permitted to make an award at our annual banquet. It appeared that the AIC did not have a truly local section and therefore had never applied for admission . . . More recently these members learned of a little-used provision for membership that had been in the Council's Constitution since the beginning, which permits nationally organized scientific societies to have a single representative on the Council, if they are not organized locally but are otherwise eligible for admission. Dr. Samuel C. Spalding, Jr., therefore petitioned the Council for such representation and it was granted . . . We are pleased to have THE AMERICAN INSTITUTE OF CHEMISTS as members and welcome them to our ranks."

Dr. Wohlleben to Receive Ohio Award

Dr. Wiliam J. Wohlleben, F.A.I.C., head, Department of Chemistry, University of Dayton, Dayton, Ohio, will receive the Ohio Award of the Ohio AIC Chapter at its all-day meeting to be held in Akron, April 15, 1955.

A plant trip to Columbia-Southern Mine will be held in the morning, followed by luncheon at the Mayflower Hotel. The Annual Business meeting will then take place. In the afternoon, a meeting for college students in the area will be held, with Dr. Ray P. Dinsmore, Hon. AIC, as speaker. At the dinner in the evening, the Ohio Award will be presented to Dr. Wohlleben.

Washington Chapter

President, Paul E. Reichardt
Vice President, Dr. Frank Gonet
Treasurer, Albert F. Parks
Secretary, T. Allan Davis
1016 Urell Place, N.E.
Washington 17, D.C.
Representative to National Council,
Paul E. Reichardt

The Chemical Management of Cancer

The Washington Chapter met January 4th at O'Donnell's Restaurant, Washington, D.C., at luncheon. Following the luncheon, Chairman Reichardt introduced the speaker, Dr. John R. Heller, director, The National Cancer Institute. Dr. Heller reviewed the progress made on the control of cancer at the National Cancer Institute and at various research centers throughout the world. He touched upon the many approaches to the subject, but stressed chemical management of cancer. Although this problem is extremely difficult and complex, the speaker was enthusiastic and hopeful of the eventual control of cancer. Dr. Heller stimulated a keen interest in this subject as evidenced by the many questions posed by the Chapter members and their guests.

The Hoover Commission

The February luncheon will be held Feb. 8, at O'Donnell's Restaurant. Dr. Jarold Kieffer, who is doing work in connection with the Hoover Commission on the Organization of the Executive Branch of the Government and with the President's Advisory Committee on Government Organization, will speak on "The Hoover Commission and Government Personnel." Dr. Kieffer is special assistant to Arthur S. Fleming, director of the Office of Defense Mobilization.

New Jersey Chapter

Chairman, Dr. H. W. Mackinney
Chairman-elect, Dr. Cecil L. Brown
Treasurer, Dr. William A. Raimond
Secretary, Dr. William R. Sullivan
Hoffmann-La Roche, Inc.
Nutley 10, N. J.
Representative to National Council,
Dr. James B. Allison

The Characteristics of Scientists

The New Jersey Chapter will meet, March 1, 1955, at a dinner at the Military Park Hotel, Newark, N. J. Dr. D. L. Cottle, F.A.I.C., research chemist with Esso Research and Engineering Company, will discuss the literature on "The Characteristics of Scientists", and also the results of a recent questionnaire on "Are Chemists Human?" An open council meeting will be held at 7:00 p.m. for discussion of further work by the Chapter regarding professional problems. The dinner ($2.90) will be held at 6:00 p.m. Dr. Cottle will speak at 8:00 p.m. Reservations for the dinner and/or meeting should be sent to Dr. W. R. Sullivan, Hoffmann-LaRoche, Inc., Nutley, N. J. (NUtley 2-5000).

New England Chapter Honors Bell

The Honor Scroll of the New England AIC Chapter will be presented to Kenneth E. Bell, retired vice president of A. C. Lawrence Leather Co., at a dinner meeting to be held at the Faculty Club of Massachusetts Institute of Technology, Cambridge, Mass., on March 1, 1955. Student medals will be presented to outstanding college students in the area.

Will You Come

Feb. 3, 1955. Pennsylvania Chapter. Dinner. 6:30 p.m. ($2.75). Engineers Club, 1317 Spruce St., Philadelphia, Pa. Speaker, Dr. John Bockris of the University of Pennsylvania, "The Chemical Profession in England."

Feb. 8, 1955. National AIC Council and Board of Directors. The Chemists' Club, 52 East 41st St., New York 17, N. Y. Dinner 6:00 p.m.

Feb. 22, 1955. Chicago Chapter. Chicago Engineers Club. Cocktails, 6:00 p.m. Steak dinner ($3.25) 6:30 p.m. Speaker, Dr. Johan Bjorksten, Director of Research, Bjorksten Laboratories (Madison, Wis.), "Effective Use of Chemists." Reservations: Ruth Hutchinson, Ca-5-9600, ext. 662.

Feb. 24, 1955. New York Chapter. The New York Times Dining Room, 229 W. 43rd St., New York, N. Y. Dinner 6:00 p.m. Speaker: Dr. Randolph Major. Subject: "Advancing Yourself in Chemistry in the Pharmaceutical and Medical Fields." Question and answer

period. Presiding Chairman, John Kotrady. Reservations ($2.75), Shepherd Stigman, Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y.

Mar. 1, 1955. New England Chapter. Dinner. Faculty Club of M.I.T., Cambridge, Mass. Award of Honor Scroll to Kenneth E. Bell. Student Medals to outstanding students of area. For information:: George B. Walker, Jr. Arthur D. Little, Inc., 30 Memorial Drive, Cambridge, Mass.

Mar. 1, 1955. New Jersey Chapter. Dinner ($2.90). Military Park Hotel, Newark, N. J., 6:00 p.m. Council Meeting, 7:00 p.m. Speaker, 8:00 p.m. Dr. D. L. Cottle, F.A.I.C., will discuss "The Characteristics of Scientists" and give results of recent questionnaire on "Are Chemists Human?" Reservations: Dr. W. R. Sullivan, Hoffmann-La Roche, Inc., Nutley, N. J. (NUtley 2-5000).

Mar. 14, 1955. Chicago Chapter. Chicago Engineers Club. Dinner 6:00 p.m. Speaker, Guy Reed, Executive Vice-president, Harris Trust & Savings Bank, "The Role of the Banker in Chemical Research." Reservation: Ruth Hutchinson, CA 5-9600, Ext. 662.

Mar. 29, 1955. New Jersey Chapter. Field Trip to Bell Telephone Laboratories, Murray Hill, N. J. Meet at 1:45 p.m. in the Murray Hill Laboratory Auditorium. Following the tour, there will be a general meeting and dinner at a nearby restaurant to talk professional affairs and transact the annual business. Reservations: Dr. W. R. Sullivan, Hoffmann-LaRoche, Inc., Nutley, N. J. (Nutley 2-5000).

Apr. 7, 1955. Pennsylvania Chapter. Dinner. Engineers Club, 1317 Spruce St., Philadelphia, Pa. Speaker: Dr. Mary Willard, F.A.I.C., Dep't of Chemistry, The Pennsylvania State University, "Women in the Chemical Profession." For information, Dr. Robert Kunin, Rohm & Hass Co., Washington Square, Philadelphia 5, Pa.

April 13, 1955. National AIC Council and Board of Directors. The Chemists' Club, 52 East 41st St., New York 17, N. Y. Dinner 6:00 p.m.

Apr. 15, 1955. Ohio Chapter. All-day meeting. Morning: Plant trip. Luncheon, Mayflower Hotel, Akron, Ohio. Annual Business meeting following luncheon. In afternoon, meeting of students with Dr. Ray P. Dinsmore, Hon. AIC, as speaker. Dinner at Mayflower Hotel. Presentation of Ohio Award to Dr. William J. Wohlleben, F.A.I.C., of University of Dayton. For information: Harold M. Olson, Harshaw Chemical Co., 1945 E. 97th St., Cleveland, Ohio.

Apr. 28, 1955. New York Chapter. The New York Times Dining Room, 229 W. 43rd St., New York, N. Y. Dinner 6:00-7:30 p.m. Presentation of Awards to Student Medalists. Speaker Dr. A. W. Fisher, Jr., Arthur D. Little, Inc., "Algæ as a Potential Future Source of Food." Question and answer period. Presiding chairman, John Kotrady. Reservations ($2.75), Shepherd Stigman, Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y.

May 5, 1955. New Jersey Chapter. Dinner, Military Park Hotel, Newark, N. J. Award of 1955 Honor Scroll to Dr. Elmore H. Northey. Reservations: W. R. Sullivan, Hoffman-LaRoche, Inc., Nutley, N. J. (NUtley 2-5000).

May 5, 1955. Pennsylvania Chapter. Student Award Meeting.

May 11, 1955. National AIC Council and Board of Directors. The LaSalle Hotel, Chicago, Ill. Dinner 6:00 p.m.

May 11, 12, 13, 1955. AIC Annual Meeting. LaSalle Hotel, Chicago 2, Ill.

May 9, 10, 11, 1956: AIC Annual Meeting. Hotel Statler, Boston, Mass.

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Chemist-writer: For Market Development Division. Experience desired in technical writing or industrial advertising. Age to 35. Salary open. Location New York City. Box 21, THE CHEMIST.

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Plant Manager: For multi-plant manufacturer of organic chemical dyestuffs and intermediates. Should be able, forceful administrator with record of successful experience. Chemical degree mandatory, and considerable experience with color making. Should be friendly and interested in the personal welfare of his subordinates, a man who can stand on his own feet. Age 35-48. Salary to $12,000 to start. Location midwest. Box 25, THE CHEMIST.

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Chemical Executive: Consultant. Age 33. Seeks challenging position to make full use of administrative ability; scientific and business knowledge in plastics, resins, cosmetics, pharmaceuticals, foods, etc. 14 years of progressively difficult experience. Past 9½ years, director of chemical laboratory conducting research-development, product evaluation, quality control. Box 24, THE CHEMIST.

Administration or Sales. 37, M.S. (Chemical Economics), F.A.I.C. Quadrupled efficiency of analytical laboratory; directed multi-plant expansion program which tripled dyestuff output; sold surplus chemicals which had been regarded as unmarketable. Experienced writer and speaker. Prefer South, but will consider any location. Box 26, THE CHEMIST.

For Your Library

The Proteins

Vol. II, Part A. H. Neurath and K. Bailey, Editors. Academic Press, Inc. 1954. 661 *pp.* 6" *x* 9". $14.00.

These nine chapters were written by nine different groups of authors. The first chapter deals with nucleic acids, nucleoproteins, viruses, bacteriophage, and related phenomena. Biological, chemical and physical aspects are extensively covered in 90 pages and supplemented by

434 references. Enzyme chemists will be glad to know that the second chapter of this book contains an excellent monograph of 152 pages on oxidizing enzymes supplemented by 572 references. Then follows an admirable presentation of the respiratory proteins, hemoglobin, chlorocruorin, hemocyanin, and hemerythrin. Next, the toxic proteins of snake venoms, of plants and those produced by microorganisms, and shock producing substances, the spreading factor, and polymolecular toxins. The toxic proteins of soybean and lima bean, however, are not reviewed. Nevertheless, this chapter is highly interesting and inspiring.

In the next chapter there is an expert discussion of all the milk proteins, including the milk enzymes. Then follows a chapter on egg proteins. It is remarkable that an active biological product such as the egg should contain only traces of a few enzymes. Apparently the enzymes form during the development of the embryo. There is one chapter on seed proteins, one on proteins and protein metabolism in plants, and one on protein hormones.

Chemists confronted with protein problems and biochemists in general will like this book for many reasons.

—Dr. Henry Tauber, F.A.I.C.

Soap Manufacture

Vol. 5. A. Davidson, E. J. Better, J. Davidsohn. Series on Fats and Oils. Interscience Publishers, Inc. 1953. 525 *pp.* $12.50.

Written in Haifa by two consulting chemists and the technical director of the Shemen Israel Oil Industries, this volume covers: (1) the theoretical principles that must be understood as a foundation for the study of soap processes; (2) the raw materials used in soap manufacturing; (3) the processes used in the manufacture; and (4) special soap products.

A short history of the soap industry, from 6 B.C. to date, is given at the beginning, followed by some statistics of the soap industry in the U.S., and a subject index completes the book.

Soap chemists should find this a useful addition to their libraries. Certainly every detail about soap manufacture is to be found in these tightly-packed pages.

—Dr. Frederick A. Hessel, F.A.I.C.

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The Structures and Reactions of the Aromatic Compounds

By A. M. Badger. Cambridge University Press. 1954. 456 *pp.* $11.50.

This first book to be devoted to the fundamental properties of the entire range of aromatic compounds, is written by Fellow of the Royal Institute of Chemists, Reader in Chemistry in the University of Adelaide.

Largely descriptive, this volume nevertheless contains detailed discussions of certain aspects of aromatic chemistry, particularly in such cases as intra-molecular cyclization. One chapter deals with the Dies-Alder reaction and another with Optical Activity in Aromatic Compounds.

The literature available to the middle of 1951 has been consulted and an index of authors follows the subject index at the end of the book. Designed primarily for advanced students, the book will prove useful to research chemists in the dyestuffs and medicinal drugs industries.

—Dr. Frederick A. Hessel, F.A.I.C.

Inorganic Thermogravimetric Analysis

By Clement Duval. Elsevier Press. 531 *pp.* 6¼" *x* 9". $11.00.

A detailed examination of analytical precipitates and their behavior on drying and ignition are contained in this volume. Thermobalances are described and curves of pyrolysis of all precipitates are given, and incidental discovery of many new compounds.

Chemical Books Abroad

Rudolph Seiden, F.A.I.C.

Carl Hanser Verlag, Munich 27: *Chemische Technologie, Vol. IV: Organische Technologie,* by K. Winnacker and E. Weingaertner: 1954, 1192 pp. (235 ill., 240 tables); DM 95.50.—The preceding four volumes of this most dependable and most modern work were more fully discussed in THE CHEMIST in the years 1951-53. The final (fifth) volume equals them in all respects—not only in regard to exquisiteness of text and high quality of illustrations, but also of paper and binding. It contains monographs on the aromatic intermediates, organic dyes, textile auxiliaries and detergents, bleaching agents, explosives, terpenes and camphor, photographic material, leather, plastics, caoutchouc, silicones, raw materials for the paint and varnish industry, foods, starch, sugar, insecticides, pharmaceuticals and biologicals — each chapter written by one or more of the leading experts of the respective German industry. The price of the complete work consisting of 5 volumes (4319 pp., 1494 ill., 787 tables) is DM 327.-

Verlag Chemie, Weinheim/Bergstr.; *Warenzeichenfibel,* by H. Wendt; 1954, 129 pp. (23 ill.); DM 9.80.—The value of trademarks and the legal requirements for their registration in Germany are competently explained. • *Energieversorgung von Chemiebetrieben,* by R. Quack; 1954, 68 pp. (11 ill.); paper covers DM 3.60—A synoptical discussion of all the energy sources used in the chemical industry.• *Chemische Technik in USA;* 1954, 156 pp. (54 ill.); paper covers DM 10.40.—This is the report of a European study group which investigated the technical and economical conditions as causes and consequences of the predominating position which the chemical industry of the U.S.A. has attained. The largest part of the report is dedicated to descriptions of industrial working methods and equipment as yet not used in Europe.

Verlag fuer chemische Industrie H. Ziolkowsky, Augsburg: *Wachs-Enzyklopaedie, Vol. I,* by L. Ivanovsky; 1954, 232 pp.—This is not an encyclopedia, but an introduction to the theories and technology of waxes, with emphasis on their chemical-physical properties and possibilities. These are discussed in 17 chapters; the second volume will probably be of more practical value.

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"Glycerine Alkyds Tailored to Need." Booklet. Glycerine Producers Association, 295 Madison Ave., New York 17, N.Y.

"Ramsbottom Carbon Residue, Apparatus." Data Sheet No. 11314. Precision Scientific, Co., 3737 W. Cortland ,St. Chicago 47, Ill.

"A True Standard." 16 mm, sound, color, film running 12 minutes, prepared by National Bureau of Standards. Information: Office of Scientific Publications, National Bureau of Standards, Washington 25, D.C.

"Transite and insulation Blocks for Laboratory supports." Circular 1244, Central Scientific Co., 1700 Irving Park Road, Chicago, Ill.

"Steam Condensers and Air Ejectors." Catalog. Condenser Service & Engineering Co., Inc., Hoboken, N.J.

"Revised Vermiculite Data Book." 16-pp. Zonolite Co., 135 S. LaSalle St., Chicago 3, Ill.

"Specific Gravity Meters." Information, The Bristol Co., Waterbury 20, Conn.

"New Refrence Guide to Silicones." Catalog. Dow Corning Corp., Midland, Mich.

"Colloidal Dispersions for Dry-film Lubrication." Bulletin 438. Acheson Colloids Co., Port Huron, Mich.

"New Sanitary D-Cartons Facilitate Inventory Handling." Information. Davis Emergency Equipment Co., Inc., Safety Div., 45 Halleck St., Newark 4, N. J.

"Titanium, New Member of the Family of Metals." 8-pp. Bulletin 43, Superior Tube Co., 1621 Germantown Pike, Norristown, Pa.

"Everything in Safety." Catalog. 130-pp. General Scientific Equipment Co., 2700 W. Huntington St., Philadelphia 32, Pa.

"Directory of Arizona Maufacturing Establishments." Research Dep't., Valley National Bank, 303 Security Building, Phoenix, Arizona.

"Manpower Resources in Mathematics." 20 cents. Superintendent of Documents, U. S. Gov. Printing Office, Washington 25, D.C.

"Uses of Chelating & Sequestering Agents in Cosmetics," by Dr. G. H. Goodyear and B.L. Hathorne. Reprint. Glyco Products Co., Inc., 26 Court St., Brooklyn 1, N. Y.

"Square Porcelain Support Stand," Information. Fisher Scientific, 717 Forbes St., Pittsburgh 19, Pa.

"James Automatic Glassware Washer." Information. Palo Laboratory Supplies, Inc., New York 7, N.Y.

"15 Portraits in Print of Diamond Chemicals You Live By." Folder. Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio.

"Economic Aspects of the Pharmaceutical Industry." Booklet. Available on request to R. S. Aries & Associates, 270 Park Ave., New York 17, N.Y.

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"New Slender Long-tip Pipette." Information, Kimble Glass Co. of Owens-Illinois Glass Co., Toledo 1, Ohio.

"Labelon Write-on Tape." Folder. No. 5. Labelon Tape Co., Inc., 450 Atlantic Ave., Rochester 9, N.Y.

"Cellosolve & Carbitol Solvents." Booklet F-4765, Carbide & Carbon Chemicals Co., 30 E. 42nd St., New York 17, N.Y.

"Indeco Microscope — 50-power with measuring scale." Information. International Development Co., 1 South Reed St., East Riverton, N.J.

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Directory: Of Certified Clinical Chemists, is now being distributed by the American Board of Clinical Chemistry. Heads of hospital departments or other laboratories which engage in clinical chemistry can secure a copy of the Directory by writing to the Secretary-Treasurer, Dr. O. H. Gaebler, Henry Ford Hospital, Detroit 2, Mich.

A copy of the Instructions to Applicants for Certification is also available without cost. Chemists wishing to apply for certification should secure this information at once, since considerable time is required to complete a formal application. Applications to be considered at the next annual meeting of the Board must be completed before March 31, 1955.

Technical Consultant: Arthur Linz, F.A.I.C., who has resigned as vice president of Climax Molybdenum Co., to open his own consulting offices at 551 Fifth Ave., New York 17, N. Y. He holds more than 100-patents issued to him in the fields of dyestuffs, pigments, chromium, molybdenum, titanium, tungsten, uranium and vanadian compounds.

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Ed. F. Degering, F.A.I.C.

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—From *Business Week*

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—*Pen*

The energy dopesters calculate that currently the world receives its energy, to keep the wheels of our complex life rolling, about as follows: Income energy, from the sun, water and wind, 23 per cent; fossil energy, from coal, gas, oil and oil shale, 77 per cent. In 2050 A.D., the income energy from sun, water and wind will account for about 15 per cent; fossil energy, for about 25 per cent; and atomic energy, for about 60 per cent of the total energy consumption of the earth.

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DR. ALBERT SCHWEIZER

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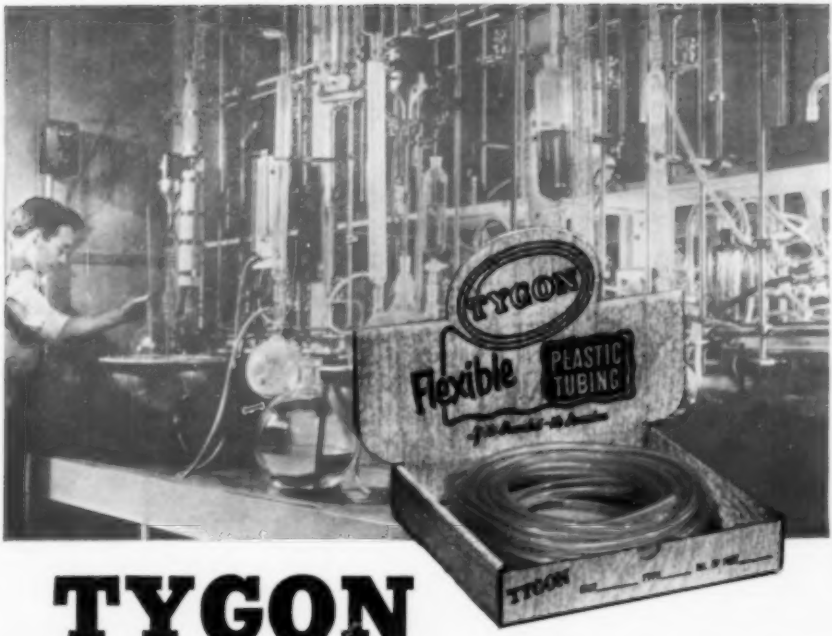

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